United States Patent [19]

Whetstone

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[54] **POSITION DETERMINATION DEVICE**

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[52] **U.S. Cl.** **178/19;** 367/156; 333/148

[58] **Field of Search** ..... 178/18, 19; 340/870.4; 346/139 C; 367/907, 168, 156, 153, 149; 333/138, 148; 33/1 M

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,273,954 6/1981 Takeuchi et al. 178/19

4,298,772 11/1981 Kobayashi et al. ..... 178/19 X

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[57] **ABSTRACT**

A position determining device has two perpendicular longitudinal magnetostrictive elements. A grid of a plurality of closed loop conductors has two parallel straight legs which form the grid. A flux producing element inductively coupled to at least one of said grid conductors causes an electrical current in that conductor. In turn that current induces a strain wave in the magnetostrictive element. Near the end of the magnetostrictive element is a sensing means to detect the strain wave comprising a lumped inductive capacitive delay line substantially having a plurality of evenly spaced inductive coils aligned with the magnetostrictive elements.

The lumped delay line is defined by the formulas

$$wv = \sqrt{LC}$$

$$Z = \sqrt{L/C}$$

$$c = C/n$$

where w is the overall length of the delay line; L is the total inductance, C is the total capacitance, Z is the terminating impedance, c is capacitance of the capacitance associated with each coil, and n is the number of coils.

15 Claims, 5 Drawing Figures